DRILL

Patent number: JP2003266224 (A)
Publication date: 2003-09-24
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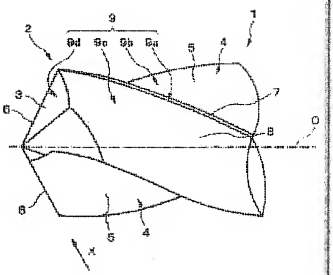
Applicant(s): MITSUBISHI MATERIALS CORP +
Classification:
- international: ***B23B51/00;*** **B23B51/00;** (IPC1-7): B23B51/00
- european:
Application number: JP20020072503 20020315
Priority number(s): JP20020072503 20020315

Also published as:
JP3864284 (B2)

Abstract of **JP 2003266224 (A)**

PROBLEM TO BE SOLVED: To provide a drill coated with a hard coating 9, which has no separation of the hard coating 9b on inner surfaces of chip discharging grooves 4 caused by repetition of re-grinding and re-coating. ; SOLUTION: The chip discharging grooves 4 are formed in an outer periphery of an end of a drill body 1. Cutting edges 6 are formed on intersection ridges between the inner surfaces 5 of the chip discharging grooves 4 and leading flanks 3 of the drill body 1. Margins 7 are formed on the outer periphery of the drill body 1 along intersection ridges between the outer periphery and the chip discharging grooves 4. The hard coating 9 is coated on a surface of the end of the drill body 1. In this drill, an average film thickness of the hard coating 9b on the inner surfaces 5 of the chip discharging groove 4 is 60% or less of an average film thickness of the hard coating 9a at the margins 7. ; COPYRIGHT: (C) 2003,JPO



CLAIMS

[Claim(s)]
[Claim 1]While a scraps spillway is formed in a point periphery of a drill body and a cutting edge is formed in an intersecting ridgeline part of inner skin of this scraps spillway, and a front end flank of the above-mentioned drill body, A margin part is formed in a periphery of the above-mentioned drill body along with an intersecting ridgeline portion with the above-mentioned scraps spillway, A drill, wherein it is in a drill with which the surface of a point of the above-mentioned drill body furthermore comes to cover hard coating and average thickness of the above-mentioned hard coating in inner skin of the above-mentioned scraps spillway is made into 60% or less to average thickness of the above-mentioned hard coating in the above-mentioned margin part.
[Claim 2]The drill according to claim 1, wherein a periphery flank which retreated to the inner circumference side to the above-mentioned margin part is formed in a periphery of the above-mentioned drill body and average thickness of the above-mentioned hard coating in this periphery flank is made into 90% or less of average thickness of hard coating in the above-mentioned margin part.
[Claim 3]The drill according to claim 1 or 2, wherein average thickness of the above-mentioned hard coating in the above-mentioned front end flank is made into 90% or less of average thickness of hard coating in the above-mentioned margin part.

[Translation done.]

* NOTICES *

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DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Field of the Invention]A cutting edge is formed at the tip of inner skin which turns to the drill hand of cut of this scraps spillway, and this invention relates to the drill used for carrying out hole dawn processing to the work which mainly consists of metallic materials while a scraps spillway is formed in the point periphery of the drill body which rotates to the circumference of an axis line.
[0002]
[Description of the Prior Art]So that the tip side of the drill body of outline cylindrical shape which rotates to a drill hand of cut focusing on an axis line at the circumference of this axis line may be made into a cutting edge as such a drill and the scraps spillway of a couple may become symmetrical mutually about an axis line at the periphery of this cutting edge, It is formed in the shape of [which is twisted to the circumference of an axis line at the back side of a drill hand of cut as it goes to the back end side from the apical surface of this cutting edge, i.e., the front end flank of a drill body,] a spiral, The so-called solid drill of the two-sheet edge with which the cutting edge was formed in the intersecting ridgeline part with the above-mentioned front end flank by the side of the tip of the portion which turns to a drill hand of cut among the inner skin of these scraps spillways is known. Therefore, in such a solid drill, the tip side of the portion which turns to the drill hand of cut of the above-mentioned scraps spillway inner skin serves as a rake face of this cutting edge. While a cutting edge, abbreviation, etc. are by using the periphery of the above-mentioned cutting edge along with an intersecting ridgeline part with a scraps spillway, and a margin part with small width of an outer diameter is formed and trying for a cutting edge to show around in slide contact with the inner circumference of a processed hole in this margin part, The cutting-edge periphery by the side of the drill hand-of-cut back of this margin part is made into the periphery flank which retreated to the inner circumference side of an one-step drill body to this margin part, and friction with a cutting edge and a processed hole is kept from becoming large more than needed.And in still such a drill, covering hard coatings, such as TiN and TiCN, on the whole surface of the above-mentioned cutting edge for improvement in the abrasion resistance of a drill body is performed.
[0003]
[Problem to be solved by the invention]By the way, in such a solid drill. If wear and a deficit arise into the portion of the above-mentioned cutting edge in spite of covering of such hard coating in the inside of long-term use, it will be made to perform what is called regrinding that grinds a new cutting edge and forms it by grinding so that the above-mentioned front end flank may be retreated to the axial direction back end side. Since the hard coating covered by the front end flank will also be removed at this time, what is called re-coating that covers hard coating again on the surface of [whole] a cutting edge after regrinding is also performed. However, since the film which is the thickness of the film with which the thickness of the hard coating covered by the front end flank is newly covered itself and by which the thickness of the margin part was also previously covered with the slide contact to a processed hole wears out in the case of coating in this case, The hard coating covered by the inner skin of the scraps spillway

to the thickness in the case of this re-coating becoming remaining as it is, Since it will fail to be deleted when the cutting edge peripheral part of the rake face with the largest wear which has little the wear also regrinds a front end flank, in order that scraps may only scrape, On the hard coating covered with previous coating as a result, new hard coating will be covered and thickness will increase for every re-coating. However, since such hard coating will become weak conversely and will become easy to produce exfoliation, if the thickness becomes thick too much, In this way, when the thickness of the hard coating of scraps spillway inner skin increased by regrinding and re-coating, there was a possibility that that abrasion resistance may be spoiled on the contrary by exfoliation of this hard coating.

[0004]This invention was made under such a background and an object of this invention is to provide the drill which does not produce exfoliation in the hard coating of scraps spillway inner skin even if it repeats regrinding and re-coating in the drill with which the above hard coatings are covered.

[0005]

[Means for solving problem]In order to solve an aforementioned problem and to attain such a purpose, this invention, While a scraps spillway is formed in the point periphery of a drill body and a cutting edge is formed in the intersecting ridgeline part of the inner skin of this scraps spillway, and the front end flank of the above-mentioned drill body, A margin part is formed in the periphery of the above-mentioned drill body along with an intersecting ridgeline portion with the above-mentioned scraps spillway, Furthermore, in the surface of the point of the above-mentioned drill body, it is in the drill with which it comes to cover hard coating, and average thickness of the above-mentioned hard coating in the inner skin of the above-mentioned scraps spillway was made into 60% or less to the average thickness of the above-mentioned hard coating in the above-mentioned margin part. Therefore, in such a drill, since average thickness of the hard coating of scraps spillway inner skin is made or less [of the average thickness of the hard coating of a margin part] into 3/5, It can suppress that the thickness of the hard coating in the scraps spillway inner skin after re-coating increases remarkably, and the exfoliation can be prevented.

[0006]The more the thickness of the hard coating in this scraps spillway inner skin is thin, the more can control increase of the thickness after re-coating, but. Since there is a possibility that the wear-resistant improved effect by hard coating itself may stop being successful when too not much thin, it is desirable to be considered as 60 to 5% to the average thickness of the hard coating of the above-mentioned margin part, and it is more desirable to be considered as further 50 to 30%. Wear of hard coating [in / when the periphery flank which retreated to the above-mentioned margin part on the periphery of the drill body at the inner circumference side is formed / this periphery flank], Although it is not so large as a margin part, therefore the hard coating previously covered at the time of re-coating is left behind, since it has worn out more greatly than wear of the inner skin of the above-mentioned scraps spillway, As for the average thickness of the above-mentioned hard coating in this periphery flank, it is desirable to use 90% or less of average thickness of the hard coating in the above-mentioned margin part. It is desirable to also make average thickness of the above-mentioned hard coating in a front end flank into 90% or less of the average thickness of the hard coating in the above-mentioned margin part.

[0007]

[Mode for carrying out the invention]Drawing 1 thru/or drawing 3 show one embodiment of this invention. As the drill body 1 makes the outline cylindrical shape centering on the axis line O with hard material, such as cemented carbide, and the drill of this embodiment shows it to drawing 1 and drawing 2, let the tip side be the cutting edge 2. And it turns to the periphery of this cutting edge 2 from the front end flank 3 at this drill body 1 tip at the back end side, It is formed so that the scraps spillways 4 and 4 of the couple twisted spirally may become symmetrical mutually about the axis line O at the back side of the drill hand of cut T as it goes in the direction of axis line O back, The portion which turns to the drill hand-of-cut T side among the inner skin 5 of this scraps spillway 4 is made into a rake face, and the cutting edge 6 is formed in the intersecting ridgeline part with the above-mentioned front end flank 3 at that tip.

[0008]The margin part 7 is formed in the intersecting ridgeline part with the scraps spillway 4 spirally twisted to the hoop direction of this cutting edge 2 in the peripheral face between the scraps spillways 4

and 4 at that drill hand-of-cut T side. That peripheral face makes the arc shaped cross section of an outer diameter equal to the above-mentioned cutting edge 6, and this margin part 7 is installed so that a hoop direction may be met over the overall length of the cutting edge 2 at the scraps spillway 4 with small constant width. As it retreats to the inner circumference side of the one-step drill body 1 to the peripheral face of this margin part 7, the periphery flank 8 which makes the arc shaped cross section of a small outer diameter is formed in the drill hand-of-cut T back side of this margin part 7. The above-mentioned cutting edge 6, and the margin part 7 and the periphery flank 8 as well as the scraps spillways 4 and 4 are also symmetrically formed the couple every about the axis line O. Back taper may be given to these margin parts 7 and the periphery flank 8.

[0009]And in the surface of the cutting edge 2 constituted in this way. The hard coating 9 is covered by the whole, and the average thickness of Perilla frutescens (L.) Britton var. crispa (Thunb.) Decne. has the small average thickness of the hard coating 9b covered by the inner skin 5 of the scraps spillway 4, and he is trying to be merely 60% or less to the average thickness of the hard coating 9a covered by the margin part 7. The average thickness of the hard coating 9c covered by the above-mentioned periphery flank 8 is also small, and he is trying to be 90% or less in this embodiment to the average thickness of the hard coating 9a covered by the margin part 7. Average thickness of 9 d of hard coatings covered by the front end flank 3 is also made into 90% or less to the average thickness of the hard coating 9a of the margin part 7. As this hard coating 9, covering one sort of TiC, TiN, TiCN, and TiAlN or two or more sorts, for example is mentioned. In order to make small thickness of the hard coating 9b in the inner skin 5 of the scraps spillway 4, or the hard coating 9c in the periphery flank 8 to the thickness of the hard coating 9a of the margin part 7 in this way, For example, what is necessary is to perform polishing to these portions and just to remove the surface of the film 9, after covering the hard coating 9.

[0010]Therefore, if re-coating work is performed so that it may regrind after using the drill constituted in this way for hole dawn processing over a long period of time, and a new film may be covered with the thickness of the ratio same subsequently as the beginning, Since the hard coating 9a covered previously has worn out by the slide contact to processed hole inner circumference by long-term hole dawn processing about the margin part 7, Although the film 9b new on the film 9b covered previously which has little wear will be covered with the inner skin 5 of the scraps spillway 4 to the hard coating 9a of the same thickness as the beginning being covered, Each of the thickness is 60% or less of the thickness of the margin part 7, and it becomes only 2 premium grade of the thickness of the hard coating 9a of the margin part 7 newly covered at the maximum noting that the previous film 9b is not worn out at all. For this reason, in this way, in regrinding and the re-coated drill, in the inner skin 5 of this scraps spillway 4, the hard coating 9b becomes weak, and exfoliation is not produced and it becomes possible to fully demonstrate the wear-resistant improved effect by this hard coating 9.

[0011]Even if the average thickness of the hard coating 9b in the inner skin 5 of this scraps spillway 4 can also make thickness after re-coating small, therefore performs many regrinding and re-coating so that this is small, become possible to lessen increase of thickness and to prevent generating of exfoliation, but. Conversely, even if thickness is too small, a possibility that sufficient abrasion resistance may no longer be obtained in the state before re-coating arises, and it is not desirable. For this reason, as for the average thickness of the hard coating 9b in the inner skin 5 of the above-mentioned scraps spillway 4, it is desirable to be considered as 60 to 5% of range to the average thickness of the hard coating 9a in the margin part 7, and it is more desirable to be considered as further 50 to 30% of range.

[0012]It is smaller than the thickness of the hard coating [in / for the thickness of the hard coating 9c / the margin part 7] 9a, and he is trying to become 90% or less by this embodiment on the other hand also in the periphery flank 8 which stands in a row in the margin part 7 of cutting-edge 2 periphery. However, since this periphery flank 8 is also retreating to the inner circumference side to the margin part 7 which ****s to processed hole inner circumference, Like the inner skin 5 of the scraps spillway 4, although wear of the hard coating 9c is small, even if wear is large, therefore newly covers the hard coating 9c of 90% of thickness of the margin part 7 rather than this inner skin 5, it is rare for thickness with the previous hard coating 9c to exceed the thickness of the margin part 7, and to produce

exfoliation. However, also about this periphery flank 8, as for the average thickness of that hard coating 9c, it is desirable to be considered as 90 to 60% to the average thickness of the hard coating 9a of the margin part 7, and being considered as 90 to 80% is more desirable. Although 9 d of hard coatings previously covered on the occasion of regrinding are ground and removed about the front end flank 3, therefore after re-coating serves as thickness whose thickness of 9 d of newly covered hard coatings is 9d of the hard coatings concerned as it is, In order to secure sufficient abrasion resistance, it is desirable to be considered as about 90 to 80% to the average thickness of the margin part 7.

[0013]

[Effect of the Invention]As explained above, even if it performs regrinding and re-coating according to this invention, It can stop that the thickness of the hard coating in the inner skin of a scraps spillway becomes thick too much, it prevents the hard coating of the portion concerned producing exfoliation by this, and it becomes possible to demonstrate certainly the wear-resistant improved effect by hard coating, etc.

[Translation done.]

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TECHNICAL FIELD

[Field of the Invention]A cutting edge is formed at the tip of inner skin which turns to the drill hand of cut of this scraps spillway, and this invention relates to the drill used for carrying out hole dawn processing to the work which mainly consists of metallic materials while a scraps spillway is formed in the point periphery of the drill body which rotates to the circumference of an axis line.

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PRIOR ART

[Description of the Prior Art]So that the tip side of the drill body of outline cylindrical shape which rotates to a drill hand of cut focusing on an axis line at the circumference of this axis line may be made into a cutting edge as such a drill and the scraps spillway of a couple may become symmetrical mutually about an axis line at the periphery of this cutting edge, It is formed in the shape of [which is twisted to the circumference of an axis line at the back side of a drill hand of cut as it goes to the back end side from the apical surface of this cutting edge, i.e., the front end flank of a drill body,] a spiral, The so-called solid drill of the two-sheet edge with which the cutting edge was formed in the intersecting ridgeline part with the above-mentioned front end flank by the side of the tip of the portion which turns to a drill hand of cut among the inner skin of these scraps spillways is known. Therefore, in such a solid drill, the tip side of the portion which turns to the drill hand of cut of the above-mentioned scraps spillway inner skin serves as a rake face of this cutting edge. While a cutting edge, abbreviation, etc. are by using the periphery of the above-mentioned cutting edge along with an intersecting ridgeline part with a scraps spillway, and a margin part with small width of an outer diameter is formed and trying for a cutting edge to show around in slide contact with the inner circumference of a processed hole in this margin part, The cutting-edge periphery by the side of the drill hand-of-cut back of this margin part is made into the periphery flank which retreated to the inner circumference side of an one-step drill body to this margin part, and friction with a cutting edge and a processed hole is kept from becoming large more than needed.And in still such a drill, covering hard coatings, such as TiN and TiCN, on the whole surface of the above-mentioned cutting edge for improvement in the abrasion resistance of a drill body is performed.

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EFFECT OF THE INVENTION

[Effect of the Invention]As explained above, even if it performs regrinding and re-coating according to this invention, It can stop that the thickness of the hard coating in the inner skin of a scraps spillway becomes thick too much, it prevents the hard coating of the portion concerned producing exfoliation by this, and it becomes possible to demonstrate certainly the wear-resistant improved effect by hard coating, etc.

[Translation done.]

TECHNICAL PROBLEM

[Problem to be solved by the invention]By the way, in such a solid drill. If wear and a deficit arise into the portion of the above-mentioned cutting edge in spite of covering of such hard coating in the inside of long-term use, it will be made to perform what is called regrinding that grinds a new cutting edge and forms it by grinding so that the above-mentioned front end flank may be retreated to the axial direction back end side. Since the hard coating covered by the front end flank will also be removed at this time, what is called re-coating that covers hard coating again on the surface of [whole] a cutting edge after regrinding is also performed. However, since the film which is the thickness of the film with which the thickness of the hard coating covered by the front end flank is newly covered itself and by which the thickness of the margin part was also previously covered with the slide contact to a processed hole wears out in the case of coating in this case, The hard coating covered by the inner skin of the scraps spillway to the thickness in the case of this re-coating becoming remaining as it is, Since it will fail to be deleted when the cutting edge peripheral part of the rake face with the largest wear which has little the wear also regrinds a front end flank, in order that scraps may only scrape, On the hard coating covered with previous coating as a result, new hard coating will be covered and thickness will increase for every re-coating. However, since such hard coating will become weak conversely and will become easy to produce exfoliation, if the thickness becomes thick too much, In this way, when the thickness of the hard coating of scraps spillway inner skin increased by regrinding and re-coating, there was a possibility that that abrasion resistance may be spoiled on the contrary by exfoliation of this hard coating.
[0004]This invention was made under such a background and an object of this invention is to provide the drill which does not produce exfoliation in the hard coating of scraps spillway inner skin even if it repeats regrinding and re-coating in the drill with which the above hard coatings are covered.

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MEANS

[Means for solving problem]In order to solve an aforementioned problem and to attain such a purpose, this invention, While a scraps spillway is formed in a point periphery of a drill body and a cutting edge is formed in an intersecting ridgeline part of inner skin of this scraps spillway, and a front end flank of the above-mentioned drill body, A margin part is formed in a periphery of the above-mentioned drill body along with an intersecting ridgeline portion with the above-mentioned scraps spillway, Furthermore, in the surface of a point of the above-mentioned drill body, it is in a drill with which it comes to cover hard coating, and average thickness of the above-mentioned hard coating in inner skin of the above-mentioned scraps spillway was made into 60% or less to average thickness of the above-mentioned hard coating in the above-mentioned margin part. Therefore, in such a drill, since average thickness of hard coating of scraps spillway inner skin is made or less [of average thickness of hard coating of a margin part] into 3/5, It can suppress that thickness of hard coating in scraps spillway inner skin after re-coating increases remarkably, and the exfoliation can be prevented.
[0006]The more thickness of hard coating in this scraps spillway inner skin is thin, the more can control increase of thickness after re-coating, but. Since there is a possibility that the wear-resistant improved effect by hard coating itself may stop being successful when too not much thin, it is desirable to be considered as 60 to 5% to average thickness of hard coating of the above-mentioned margin part, and it is more desirable to be considered as further 50 to 30%. Wear of hard coating [in / when a periphery flank which retreated to the above-mentioned margin part on a periphery of a drill body at the inner circumference side is formed / this periphery flank], Although it is not so large as a margin part, therefore hard coating previously covered at the time of re-coating is left behind, since it has worn out more greatly than wear of inner skin of the above-mentioned scraps spillway, As for average thickness of the above-mentioned hard coating in this periphery flank, it is desirable to use 90% or less of average thickness of hard coating in the above-mentioned margin part. It is desirable to also make average thickness of the above-mentioned hard coating in a front end flank into 90% or less of average thickness of hard coating in the above-mentioned margin part.
[0007]
[Mode for carrying out the invention]Drawing 1 thru/or drawing 3 show one embodiment of this invention. As the drill body 1 makes outline cylindrical shape centering on the axis line O with hard material, such as cemented carbide, and a drill of this embodiment shows it to drawing 1 and drawing 2, let the tip side be the cutting edge 2. And it turns to a periphery of this cutting edge 2 from the front end flank 3 at this drill body 1 tip at the back end side, It is formed so that the scraps spillways 4 and 4 of a couple twisted spirally may become symmetrical mutually about the axis line O at the back side of the drill hand of cut T as it goes in the direction of axis line O back, A portion which turns to the drill hand-of-cut T side among the inner skin 5 of this scraps spillway 4 is made into a rake face, and the cutting edge 6 is formed in an intersecting ridgeline part with the above-mentioned front end flank 3 at that tip.
[0008]The margin part 7 is formed in an intersecting ridgeline part with the scraps spillway 4 spirally twisted to a hoop direction of this cutting edge 2 in a peripheral face between the scraps spillways 4 and 4 at that drill hand-of-cut T side. That peripheral face makes an arc shaped cross section of an outer

diameter equal to the above-mentioned cutting edge 6, and this margin part 7 is installed so that a hoop direction may be met over an overall length of the cutting edge 2 at the scraps spillway 4 with small constant width. As it retreats to the inner circumference side of the one-step drill body 1 to a peripheral face of this margin part 7, the periphery flank 8 which makes an arc shaped cross section of a small outer diameter is formed in the drill hand-of-cut T back side of this margin part 7. The above-mentioned cutting edge 6, and the margin part 7 and the periphery flank 8 as well as the scraps spillways 4 and 4 are also symmetrically formed the couple every about the axis line O. Back taper may be given to these margin parts 7 and the periphery flank 8.

[0009]And in the surface of the cutting edge 2 constituted in this way. The hard coating 9 is covered by the whole, and average thickness of Perilla frutescens (L.) Britton var. crispa (Thunb.) Decne. has small average thickness of the hard coating 9b covered by the inner skin 5 of the scraps spillway 4, and he is trying to be merely 60% or less to average thickness of the hard coating 9a covered by the margin part 7. Average thickness of the hard coating 9c covered by the above-mentioned periphery flank 8 is also small, and he is trying to be 90% or less in this embodiment to average thickness of the hard coating 9a covered by the margin part 7. Average thickness of 9 d of hard coatings covered by the front end flank 3 is also made into 90% or less to average thickness of the hard coating 9a of the margin part 7. As this hard coating 9, covering one sort of TiC, TiN, TiCN, and TiAlN or two or more sorts, for example is mentioned. In order to make small thickness of the hard coating 9b in the inner skin 5 of the scraps spillway 4, or the hard coating 9c in the periphery flank 8 to thickness of the hard coating 9a of the margin part 7 in this way, For example, what is necessary is to perform polishing to these portions and just to remove the surface of the film 9, after covering the hard coating 9.

[0010]Therefore, if re-coating work is performed so that it may regrind after using the drill constituted in this way for hole dawn processing over a long period of time, and a new film may be covered with the thickness of the ratio same subsequently as the beginning, Since the hard coating 9a covered previously has worn out by the slide contact to processed hole inner circumference by long-term hole dawn processing about the margin part 7, Although the film 9b new on the film 9b covered previously which has little wear will be covered with the inner skin 5 of the scraps spillway 4 to the hard coating 9a of the same thickness as the beginning being covered, Each of the thickness is 60% or less of the thickness of the margin part 7, and it becomes only 2 premium grade of the thickness of the hard coating 9a of the margin part 7 newly covered at the maximum noting that the previous film 9b is not worn out at all. For this reason, in this way, in regrinding and the re-coated drill, in the inner skin 5 of this scraps spillway 4, the hard coating 9b becomes weak, and exfoliation is not produced and it becomes possible to fully demonstrate the wear-resistant improved effect by this hard coating 9.

[0011]Even if the average thickness of the hard coating 9b in the inner skin 5 of this scraps spillway 4 can also make thickness after re-coating small, therefore performs many regrinding and re-coating so that this is small, become possible to lessen increase of thickness and to prevent generating of exfoliation, but. Conversely, even if thickness is too small, a possibility that sufficient abrasion resistance may no longer be obtained in the state before re-coating arises, and it is not desirable. For this reason, as for the average thickness of the hard coating 9b in the inner skin 5 of the above-mentioned scraps spillway 4, it is desirable to be considered as 60 to 5% of range to the average thickness of the hard coating 9a in the margin part 7, and it is more desirable to be considered as further 50 to 30% of range.

[0012]It is smaller than the thickness of the hard coating [in / for the thickness of the hard coating 9c / the margin part 7] 9a, and he is trying to become 90% or less by this embodiment on the other hand also in the periphery flank 8 which stands in a row in the margin part 7 of cutting-edge 2 periphery. However, since this periphery flank 8 is also retreating to the inner circumference side to the margin part 7 which ****s to processed hole inner circumference, Like the inner skin 5 of the scraps spillway 4, although wear of the hard coating 9c is small, even if wear is large, therefore newly covers the hard coating 9c of 90% of thickness of the margin part 7 rather than this inner skin 5, it is rare for thickness with the previous hard coating 9c to exceed the thickness of the margin part 7, and to produce exfoliation. However, also about this periphery flank 8, as for the average thickness of that hard coating

9c, it is desirable to be considered as 90 to 60% to the average thickness of the hard coating 9a of the margin part 7, and being considered as 90 to 80% is more desirable. Although 9 d of hard coatings previously covered on the occasion of regrinding are ground and removed about the front end flank 3, therefore after re-coating serves as thickness whose thickness of 9 d of newly covered hard coatings is 9d of the hard coatings concerned as it is, In order to secure sufficient abrasion resistance, it is desirable to be considered as about 90 to 80% to the average thickness of the margin part 7.

[Translation done.]

DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]
[Drawing 1]It is a top view of the cutting edge 2 by the side of the drill body 1 tip which shows one embodiment of this invention.
[Drawing 2]It is the front view which saw the embodiment shown in drawing 1 from the tip side.
[Drawing 3]It is a side view of the arrow X directional vision in drawing 1.
[Explanations of letters or numerals]
1 Drill body
2 Cutting edge
3 Front end flank
4 Scraps spillway
5 Inner skin of the scraps spillway 4
6 Cutting edge
7 Margin part
8 Periphery flank
Nine (9a, 9b, 9c, 9d) Hard coating
O The axis line of the drill body 1
T Drill hand of cut

[Translation done.]

(19)日本国特許庁（ＪＰ）　(12) **公開特許公報**（Ａ）　(11)特許出願公開番号
特開2003－266224
（P2003－266224A）
(43)公開日　平成15年９月24日(2003.9.24)

(51)Int.Cl.⁷	識別記号	ＦＩ	ﾃｰﾏｺｰﾄﾞ(参考)
Ｂ２３Ｂ　51/00		Ｂ２３Ｂ　51/00	Ｌ　３Ｃ０３７ Ｊ Ｋ

審査請求　未請求　請求項の数３　ＯＬ　（全４頁）

(21)出願番号　特願2002－72503(P2002－72503)

(22)出願日　平成14年３月15日(2002.3.15)

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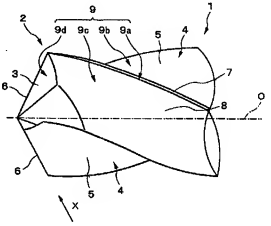
(54)【発明の名称】　ドリル

(57)【要約】
【課題】　硬質被膜９が被覆されるドリルにおいて、再研磨、再コーティングを繰り返しても切屑排出溝４の内周面５の硬質被膜９ｂに剥離を生じたりすることのないドリルを提供する。
【解決手段】　ドリル本体１の先端部外周に切屑排出溝４が形成され、この切屑排出溝４の内周面５とドリル本体１の先端逃げ面３との交差稜線部に切刃６が形成されるとともに、ドリル本体１の外周には切屑排出溝４との交差稜線部分に沿ってマージン部７が形成され、さらにドリル本体１の先端部の表面には硬質被膜９が被覆されてなるドリルにあって、マージン部７における硬質被膜９ａの平均膜厚に対し、切屑排出溝４の内周面５における硬質被膜９ｂの平均膜厚を６０％以下とする。



【特許請求の範囲】
【請求項１】　ドリル本体の先端部外周に切屑排出溝が形成され、この切屑排出溝の内周面と上記ドリル本体の先端逃げ面との交差稜線部に切刃が形成されるとともに、上記ドリル本体の外周には上記切屑排出溝との交差稜線部分に沿ってマージン部が形成され、さらに上記ドリル本体の先端部の表面には硬質被膜が被覆されてなるドリルにあって、上記マージン部における上記硬質被膜の平均膜厚に対し、上記切屑排出溝の内周面における上記硬質被膜の平均膜厚が６０％以下とされていることを特徴とするドリル。
【請求項２】　上記ドリル本体の外周には、上記マージン部に対して内周側に後退した外周逃げ面が形成されており、この外周逃げ面における上記硬質被膜の平均膜厚が、上記マージン部における硬質被膜の平均膜厚の９０％以下とされていることを特徴とする請求項１に記載のドリル。
【請求項３】　上記先端逃げ面における上記硬質被膜の平均膜厚が、上記マージン部における硬質被膜の平均膜厚の９０％以下とされていることを特徴とする請求項１または請求項２に記載のドリル。
【発明の詳細な説明】
【０００１】
【発明の属する技術分野】本発明は、軸線回りに回転されるドリル本体の先端部外周に切屑排出溝が形成されるとともに、この切屑排出溝のドリル回転方向を向く内周面の先端に切刃が設けられ、主として金属材よりなる加工物に穴明け加工をするのに用いられるドリルに関するものである。
【０００２】
【従来の技術】このようなドリルとしては、軸線を中心として該軸線回りにドリル回転方向に回転される概略円柱状のドリル本体の先端側が切刃部とされ、この切刃部の外周に一対の切屑排出溝が、軸線に関して互いに対称となるように、該切刃部の先端面、すなわちドリル本体の先端逃げ面から後端側に向かうに従い軸線回りにドリル回転方向の後方側に捩れる螺旋状に形成され、これらの切屑排出溝の内周面のうちドリル回転方向を向く部分の先端側の上記先端逃げ面との交差稜線部に切刃が形成された、いわゆる２枚刃のソリッドドリルが知られている。従って、このようなソリッドドリルでは、上記切屑排出溝内周面のドリル回転方向を向く部分の先端側が、この切刃のすくい面となる。また、上記切刃部の外周には、切屑排出溝との交差稜線部に沿って切刃と略等しい外径の幅の小さなマージン部が形成され、このマージン部が加工穴の内周に摺接して切刃部が案内されるようにされているとともに、このマージン部のドリル回転方向後方側の切刃部外周は、該マージン部に対して一段ドリル本体の内周側に後退した外周逃げ面とされ、切刃部と加工穴との摩擦が必要以上に大きくならないようにされている。そして、さらにこのようなドリルでは、ドリル本体の耐摩耗性の向上のために上記切刃部の表面全体にＴｉＮやＴｉＣＮ等の硬質被膜を被覆することが行われている。
【０００３】
【発明が解決しようとする課題】ところで、このようなソリッドのドリルでは、このような硬質被膜の被覆にも拘わらず再研磨をしないうちに上記切刃の部分に摩耗や欠損が生じると、上記先端逃げ面を軸線方向後端側に後退させるように研磨することにより、新たな切刃を研ぎつけて形成する、いわゆる再研磨を行うようにしている。また、このときには先端逃げ面に被覆された硬質被膜も取り除かれてしまうので、再研磨後に切刃部の表面全体に再度硬質被膜を被覆する、いわゆる再コーティングも行われる。ところが、この際コーティングの際、先端逃げ面に被覆される硬質被膜の膜厚は新たに被覆される被膜の厚さそのものであり、またマージン部の膜厚も、加工穴との摺接によって先に被覆された被膜が摩滅してしまうため、この再コーティングの際の膜厚がそのままとなるのに対し、切屑排出溝の内周面に被覆された硬質被膜は、切屑が擦過するだけであるためその摩耗が少なく、最も摩耗の大きいすくい面の切刃周辺部分も先端逃げ面を再研磨する際に削り落とされてしまうので、結果的に先のコーティングで被覆された硬質被膜の上に新たな硬質被膜が被覆されることとなり、膜厚が再コーティングごとに増大してゆくこととなる。しかるに、このような硬質被膜は、その膜厚が厚くなりすぎると逆に脆くなって剥離を生じやすくなるため、こうして再研磨、再コーティングによって切屑排出溝内周面の硬質被膜の膜厚が増大してゆくと、この硬質被膜の剥離によりその耐摩耗性が却って損なわれてしまうおそれがあった。
【０００４】本発明は、このような背景の下になされたもので、上述のような硬質被膜が被覆されるドリルにおいて、再研磨、再コーティングを繰り返しても切屑排出溝内周面の硬質被膜に剥離を生じたりすることのないドリルを提供することを目的としている。
【０００５】
【課題を解決するための手段】上記課題を解決してこのような目的を達成するために、本発明は、ドリル本体の先端部外周に切屑排出溝が形成され、この切屑排出溝の内周面と上記ドリル本体の先端逃げ面との交差稜線部に切刃が形成されるとともに、上記ドリル本体の外周には上記切屑排出溝との交差稜線部分に沿ってマージン部が形成され、さらに上記ドリル本体の先端部の表面には硬質被膜が被覆されてなるドリルにあって、上記マージン部における上記硬質被膜の平均膜厚に対し、上記切屑排出溝の内周面における上記硬質被膜の平均膜厚を６０％以下としたことを特徴とする。従って、このようなドリルにおいては、切屑排出溝内周面の硬質被膜の平均膜厚がマージン部の硬質被膜の平均膜厚の３／５以下とされ

ているので、再コーティング後の切屑排出溝内周面における硬質被膜の膜厚が著しく増大するのを抑えることができ、その刃離を防止することができる。

【０００６】なお、この切屑排出溝内周面における硬質被膜の膜厚は、薄ければ薄いほど再コーティング後の膜厚の増大を抑制することができるが、あまり薄すぎると硬質被膜による耐摩耗性の向上効果自体が奏功されなくなるおそれがあるので、上記マージン部の硬質被膜の平均膜厚に対して６０～５％とされるのが望ましく、さらに５０～３０％とされるのがより望ましい。また、ドリル本体の外周に、上記マージン部に対して内周側に後退した外周逃げ面を形成した場合、この外周逃げ面における硬質被膜の摩耗は、マージン部ほどは大きくなく、従って再コーティング時に先に被覆された硬質被膜が残されてはいるものの、上記切屑排出溝の内周面の摩耗よりは大きく摩耗しているため、この外周逃げ面における上記硬質被膜の平均膜厚は、上記マージン部における硬質被膜の平均膜厚の９０％以下とされるのが望ましい。さらに、先端逃げ面における上記硬質被膜の平均膜厚も、上記マージン部における硬質被膜の平均膜厚の９０％以下とされるのが望ましい。

【０００７】

【発明の実施の形態】図１ないし図３は、本発明の一実施形態を示すものである。本実施形態のドリルは、そのドリル本体１が超硬合金等の硬質材料によって軸線Ｏを中心とした概略円柱状をなし、図１および図２に示すようにその先端側が切刃部２とされている。そして、この切刃部２の外周には、該ドリル本体１先端の先端逃げ面３から後端側に向けて、軸線Ｏ方向に後方に向かうに従いドリル回転方向Ｔの後方側に螺旋状に捩れる一対の切屑排出溝４，４が軸線Ｏに関して互いに対称となるように形成され、この切屑排出溝４の内周面５のうちドリル回転方向Ｔ側を向く部分がすくい面とされて、その先端の上記先端逃げ面３との交差稜線部に切刃６が形成されている。

【０００８】また、この切刃部２の周方向に切屑排出溝４，４の間の外周面には、そのドリル回転方向Ｔ側において螺旋状に捩れた切屑排出溝４との交差稜線部に、マージン部７が形成されている。このマージン部７は、その外周面が上記切刃６と等しい外径の断面円弧状をなし、周方向に小さな一定幅で切刃部２の全長に渡って切屑排出溝４に沿うように延設されている。さらに、このマージン部７のドリル回転方向Ｔ後方側には、該マージン部７の外周面に対して一段ドリル本体１の内周側に後退するようにして、小さな外径の断面円弧状をなす外周逃げ面８が形成されている。なお、上記切刃６やマージン部７および外周逃げ面８も、切屑排出溝４，４と同様に軸線Ｏに関して対称に一対ずつ形成されている。また、これらマージン部７や外周逃げ面８にはバックテーパが与えられていてもよい。

【０００９】そして、このように構成された切刃部２の表面には、その全体に硬質被膜９が被覆されており、ただしその平均膜厚は、マージン部７に被覆された硬質被膜９ａの平均膜厚に対して、切屑排出溝４の内周面５に被覆された硬質被膜９ｂの平均膜厚が小さく、６０％以下となるようにされている。また、本実施形態では、上記外周逃げ面８に被覆された硬質被膜９ｃの平均膜厚も、マージン部７に被覆された硬質被膜９ａの平均膜厚に対して小さく、９０％以下となるようにされている。さらに、先端逃げ面３に被覆される硬質被膜９ｄの平均膜厚も、マージン部７の硬質被膜９ａの平均膜厚に対して９０％以下とされている。なお、この硬質被膜９としては、例えばＴｉＣ、ＴｉＮ、ＴｉＣＮ、ＴｉＡｌＮの１種または複数種を被覆することが挙げられる。また、このように切屑排出溝４の内周面５における硬質被膜９ｂや外周逃げ面８における硬質被膜９ｃの膜厚をマージン部７の硬質被膜９ａの膜厚に対して小さくするには、例えば硬質被膜９を被覆した後にこれらの部分にバフ加工を施したりして被膜９の表面を除去したりすればよい。

【００１０】従って、このように構成されたドリルを穴明け加工に長期使用した後に再研磨を行い、次いで当初と同じ比率の膜厚で新たな被膜が被覆されるように再コーティング作業を行うと、マージン部７については、先に被覆された硬質被膜９ａが長期の穴明け加工によって加工穴内周との摺接により摩滅しているため、当初と同じ膜厚の硬質被膜９ａが被覆されるのに対し、切屑排出溝４の内周面５では摩滅が少なく、先に被覆された被膜９ｂの上に新たな被膜９ｂが被覆されることとなるが、その膜厚はいずれもマージン部７の膜厚の６０％以下であり、先の被膜９ｂが全く摩耗していなかったとして最大でも新たに被覆されたマージン部７の硬質被膜９ａの膜厚の２割増し程度にしかならない。このため、こうして再研磨、再コーティングされたドリルにおいては、この切屑排出溝４の内周面５において硬質被膜９ｂが脆くなって剥離を生じたりすることがなく、この硬質被膜９による耐摩耗性の向上効果を十分に発揮することが可能となる。

【００１１】なお、この切屑排出溝４の内周面５における硬質被膜９ｂの平均膜厚は、これが小さいほど再コーティング後の膜厚も小さくでき、従って多数回の再研磨、再コーティングを施しても膜厚の増大を少なくして剥離の発生を防ぐことが可能となるが、逆に膜厚が小さすぎても、再コーティング前の状態において十分な耐摩耗性が得られなくなるおそれが生じて望ましくない。このため、上記切屑排出溝４の内周面５における硬質被膜９ｂの平均膜厚は、マージン部７における硬質被膜９ａの平均膜厚に対して６０～５％の範囲とされるのが望ましく、さらには５０～３０％の範囲とされるのが、より望ましい。

【0012】一方、本実施形態では、切刃部2外周のマージン部7に連なる外周逃げ面8においても、その硬質被膜9cの膜厚をマージン部7における硬質被膜9aの膜厚よりも小さく、90%以下となるようにしている。しかるに、この外周逃げ面8も、加工穴内周に摺接するマージン部7に対して内周側に後退しているため、切屑排出溝4の内周面5と同様に硬質被膜9cの摩滅は小さいものの、この内周面5よりは摩滅が大きく、従ってマージン部7の90%の厚さの硬質被膜9cを新たに被覆しても、先の硬質被膜9cとの膜厚がマージン部7の膜厚を上回って剥離を生じたりすることは少ない。ただし、この外周逃げ面8についても、その硬質被膜9cの平均膜厚は、マージン部7の硬質被膜9aの平均膜厚に対して90～60%とされるのが望ましく、90～80%とされるのがより望ましい。また、先端逃げ面3に関しては、再研磨の際に先に被覆された硬質被膜9dも研磨されて除去され、従って再コーティング後は新たに被覆された硬質被膜9dの膜厚がそのまま当該硬質被膜9dの厚さとなるが、十分な耐摩耗性を確保するには、マージン部7の平均膜厚に対して90～80%程度とされるのが望ましい。

【0013】

【発明の効果】以上説明したように、本発明によれば、再研磨、再コーティングを行っても、切屑排出溝の内周面における硬質被膜の膜厚が厚くなりすぎてしまうのを抑えることができ、これにより当該部分の硬質被膜が剥離を生じたりするのを防いで、硬質被膜による耐摩耗性の向上効果などを確実に発揮することが可能となる。

【図面の簡単な説明】

【図1】 本発明の一実施形態を示すドリル本体1先端側の切刃部2の平面図である。

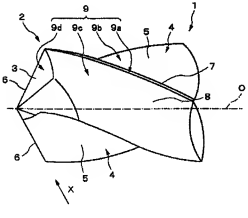
【図2】 図1に示す実施形態を先端側からみた正面図である。

【図3】 図1における矢線X方向視の側面図である。

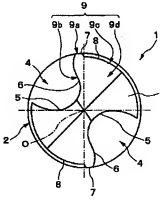
【符号の説明】

1 ドリル本体
2 切刃部
3 先端逃げ面
4 切屑排出溝
5 切屑排出溝4の内周面
6 切刃
7 マージン部
8 外周逃げ面
9（9a，9b，9c，9d） 硬質被膜
O ドリル本体1の軸線
T ドリル回転方向

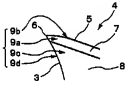
【図1】



【図2】



【図3】



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Fターム(参考) 3C037 CC01 DD01 DD03